

DETAILED ACTION
EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. William Reid on October 21, 2010.

2. The application is amended as follows.

Claims 1-28, 46, 47, 51 are cancelled.

Claim 54 is amended as follows.

54. (currently amended) Butene-1 copolymers comprising a content ~~up to~~ from 0.1 to 40% by mole of at least one

comonomer, the comonomer being selected from ethylene, propylene, or mixtures thereof, the butene-1 copolymers further comprising:

- a) a product of the reactivity ratios $r_1 \cdot r_2 \leq 1.5$;
- b) a content of butene-1 units in form of isotactic pentads (mmmm) > 98.5%; and
- c) an absence of 4,1 insertions of butene units,

the butene-1 copolymers being produced by a process comprising copolymerizing butene-1 and the at least one comonomer in the presence of a stereospecific catalyst comprising: (A) a solid catalyst component comprising a Ti compound of formula $Ti(OR)_{n-y}X_y$, where $n=4$; X is a halogen; and y is a number from 1 to n, and an electron-donor compound selected from phthalates, supported on $MgCl_2$; (B) an alkylaluminum compound; and (C) a hexyltrimethoxysilane external donor.

Claim 29 is amended as follows:

29. (~~Previously presented~~currently amended) The butene-1 copolymers according to claim 28~~54~~, wherein the content of (mmmm) is >99% and the reactivity ratio $r_1 \cdot r_2 \leq 1$.

Claim 30 is amended as follows:

30. (~~Previously presented~~currently amended) The butene-1 copolymers according to claim 28~~54~~ further comprising a PI ranging from 3-10.

Claim 31 is amended as follows:

31. (~~Previously presented~~currently amended) The butene-1 copolymers according to claim 28~~54~~, wherein the content of the at least one comonomer ranges from 0.1 to 35% by mol.

Claim 32 is amended as follows:

32. (~~Previously presented~~currently amended) The butene-1 copolymers according to claim 31~~54~~, wherein the content of the at least one comonomer ranges from 0.5 to 30% by mol.

Claim 33 is amended as follows:

33. (~~Previously presented~~Currently amended) The butene-1 copolymers according to claim ~~32~~54, wherein the at least one comonomer is ethylene.

Claim 34 is amended as follows:

34. (~~Previously presented~~Currently amended) The butene-1 copolymers according to claim ~~32~~54, wherein the at least one comonomer is propylene.

Claim 35 is amended as follows:

35. (~~Previously presented~~Currently amended) The butene-1 copolymers according to claim ~~38~~54, wherein the content of the at least one comonomer is lower than about 3% by mol.

Claim 36 is amended as follows:

36. (~~Previously presented~~Currently amended) The butene-1 copolymers according to claim ~~32~~54, wherein the content of the at least one comonomer ranges from 2-15% by mol.

Claim 37 is amended as follows:

37. (~~Previously presented~~Currently amended) The butene-1 copolymers according to claim ~~38~~54, wherein the content of the at least one comonomer is at least 12% by mol.

Claim 38 is amended as follows:

38. (~~Previously presented~~Currently amended) The butene-1 copolymers according to claim ~~37~~54, wherein the comonomer is ethylene.

Claim 39 is amended as follows:

39. (~~Previously presented~~Currently amended) The butene-1 copolymers according to claim ~~37~~54, wherein the butene-1 copolymers do not show a melting point at the thermal analysis.

Claim 40 is amended as follows:

40. (Currently amended) A polymer composition comprising: A) from 1 to 99wt% of a ~~the~~ butene-1 copolymer of claim 54 comprising a content up to 40% by mol of at least one comonomer, the comonomer being selected from ethylene, propylene, or mixtures thereof, ~~the butene-1 copolymers further comprising:~~

a) ~~a product of the reactivity ratios $r_1 \cdot r_2 < 1.5$;~~

b) ~~a content of butene-1 units in form of isotactic pentads (mmmm) > 98.5%; and~~

c) ~~an absence of 4,1 insertions of butene units;~~

and (B) from 1 to 99%~~wt~~ of another polymeric component; the said percentages being referred to the sum of (A) and (B).

Claim 43 is amended as follows:

43. (~~Previously presented~~Currently amended) A polymer composition comprising:

(A) from 5 to 40%wt of ~~the butene-1 copolymers of claim 54 comprising from 1 to 15% by mol of ethylene, propylene, or mixtures thereof, the butene-1 copolymers further comprising:~~

(~~B) a product of the reactivity ratios $r_1 \cdot r_2 < 1.5$;~~

(~~C) b) a content of butene-1 units in form of isotactic pentads (mmmm) > 98.5%; and~~

(~~A) c) an absence of 4,1 insertions of butene units; and~~

(B) from 50 to 95%wt of a propylene copolymer comprising from 1 to 30 % by mol of at least one comonomer, the comonomer being selected from ethylene and an α -olefin of formula $\text{CH}_2=\text{CHR}$, wherein R is a $\text{C}_2\text{-C}_{10}$ hydrocarbon group.

Claim 48 is amended as follows:

48. (Currently amended) A polymer composition comprising: (i) from 5 to 25wt% of a ~~the~~ butene-1 copolymer of claim 54 comprising a content up to 40% by mol of at least one comonomer, the comonomer being selected from ethylene, propylene, or mixtures thereof, the butene-1 copolymers further comprising:

- a) ~~a product of the reactivity ratios $r_1 r_2 < 1-5$;~~
- b) ~~a content of butene-1 units in form of isotactic pentads (mmmm) > 98.5%; and~~
- c) ~~an absence of 4,1 insertions of butene units;~~

and (ii) from 75 to 95wt of an ethylene polymer; said percentages being based on the sum of (i) and (ii).

Claim 49 is amended as follows:

49. ~~(Previously presented)~~ (Currently amended) Manufactured articles obtained from a composition comprising at least one ~~the~~ butene-1 copolymer of claim 54 ~~comprising a content up to 40% by mol~~ of at least one comonomer, the comonomer being selected from ethylene, propylene, or mixtures thereof, the butene-1 copolymers further comprising:

- a) ~~a product of the reactivity ratios $r_1 r_2 < 1-5$;~~
- b) ~~a content of butene-1 units in form of isotactic pentads (mmmm) > 98.5%; and~~
- c) ~~an absence of 4,1 insertions of butene units;~~

Claim 50 is amended as follows:

50. (Currently amended) A process for preparing butene-1 copolymers comprising a content up to from 0.1 to 40% by mol of at least one comonomer, the comonomer being selected from ethylene, propylene, or mixtures thereof, the butene-1 copolymers further comprising:

- a) a product of the reactivity ratios $r_1 \cdot r_2 \leq 1.5$;
- b) a content of butene-1 units in form of isotactic pentads (mmmm) > 98.5%; and
- c) an absence of 4,1 insertions of butene units,

the process comprising copolymerizing butene-1 and at least one comonomer, the comonomer being selected from ethylene, propylene, and mixtures thereof, in presence of a stereospecific catalyst comprising (A) a solid catalyst component comprising a Ti compound of formula $Ti(OR)_nX_y$, where $n=4$; X is a halogen; and y is a number from 1 to n, and an electron-donor compound selected from phthalates, supported on $MgCl_2$; (B) an alkylaluminum compound; and (C) an external electron-donor compound of formula $R_a^5R_b^6Si(OR)_n$, wherein $a=0$ and $b=1$; c is 3; and R^a is a branched alkyl or cycloalkyl group optionally comprising at least one heteroatom; and R^b is methyl a hexyltrimethoxysilane external donor.

3. Claims are renumbered as follows.

Claim 54 becomes claim 1.

Claim 29 becomes claim 2, dependent on claim 1.

Claim 30 becomes claim 3, dependent on claim 1.

Claim 31 becomes claim 4, dependent on claim 1.

Claim 32 becomes claim 5, dependent on claim 1.

Claim 33 becomes claim 6, dependent on claim 1.

Claim 34 becomes claim 7, dependent on claim 1.

Claim 35 becomes claim 8, dependent on claim 1.

Claim 36 becomes claim 9, dependent on claim 1.

Claim 37 becomes claim 10, dependent on claim 1.

Claim 38 becomes claim 11, dependent on claim 1.

Claim 39 becomes claim 12, dependent on claim 1.

Claim 40 becomes claim 13, dependent on claim 1.

Claim 41 becomes claim 14, dependent on claim 13.

Claim 42 becomes claim 15, dependent on claim 13.

Claim 43 becomes claim 16, dependent on claim 1.

Claim 44 becomes claim 17, dependent on claim 16.

Claim 45 becomes claim 18, dependent on claim 16.

Claim 48 becomes claim 19, dependent on claim 1.

Claim 49 becomes claim 20, dependent on claim 1.

Claim 50 becomes claim 21.

Claim 52 becomes claim 22, dependent on claim 21.

Claim 53 becomes claim 23, dependent on claim 21.

Reasons for Allowance

4. The following is an examiner's statement of reasons for allowance:

The present claims are allowable over the "closest" prior art, namely **Masaki et al** (EP 640,624), **Fukui et al** (US 4,600,762) and **Cozewith et al** (US 2002/0004575).

5. **Masaki et al** discloses olefin copolymers and a process for for stereospecific polymerization of an alpha-olefin having 3 or more carbon atoms where the process comprises copolymerizing the above mentioned olefins in the presence of the catalyst system comprising titanium, magnesium, halogen components; an organic aluminum compound; and an external donor organic silicon compound represented by the formula I:



where R1 is methyl, R2, R3 represent C1-3 hydrocarbon group (page 3, lines 33-55).

Though butene-1 monomers are mentioned in **Masaki et al**, however, neither specific copolymers of butene-1, as the main monomer, with 0.1-40%mol of ethylene or propylene nor their product reactivity ratio values, isotactic pentad content nor absence of 4,1 insertions of butene units, were disclosed.

Though newly added instant claims 54 is product-by-process type claim, however, the process used for producing the butene-1 copolymers of the instant invention comprising polymerization in the presence of titanium catalyst, an alkylaluminum compound and a hexyltrimethoxysilane external donor, produces materially different product (copolymer of butene-1 with 0.1-40%mol of ethylene or propylene having specific product reactivity ratio, pentad isotacticity and absence of 4,1 insertions of butene units). Though the use of hexyltrimethoxysilane is cited by **Masaki et al** as one of the possible external donors among others (page 7, lines 1-23) and **Fukui et al** discloses a process for producing random butene-1 copolymers (i.e. having productivity ratio of less than 1.5 as shown by

Cozewith et al) in the presence of titanium catalyst, organoaluminum compound and an organic silicon compound similar to the compound I of **Masaki et al**, however, as shown by the Declaration filed by Applicant, only thexyltrimethoxysilane external donor in combination with titanium chloride catalyst, can produce the polybutene-1 copolymers having both the product of reactivity ratios $r_1 \cdot r_2$ of less than 1.5 and isotactic pentad content of more than 98.5% (Attachment B), as claimed in the instant invention. Therefore, the instant claims are allowable over the applied prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Irina Krylova whose telephone number is (571)270-7349. The examiner can normally be reached on Monday-Friday 8:00am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasudevan Jagannathan can be reached on (571)272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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